Work the following problems on the paper provided. I am much less interested in the answers to the questions (10%) than in the processes you use to find the answers (90%).

1. (10 points) P and Q are points in the xy-plane, and M is the midpoint of the line segment PQ. If P = (3, -7) and M = (1, -3), find the coordinates of Q.

2. (10) Suppose P is the point (1, 4). Find any point Q so that the slope of the line through P and Q is –2/3.

3. (10) Suppose f is the function with the formula $f(x) = \arcsin\left(\dfrac{\sqrt{x}}{2}\right)$. Find an equation

    for the line that intersects the graph of f at the two points with x-coordinates 1 and 4.

4. (10) In the diagram, P = (2, 0), the length of the line segment PQ is 3, and the angle between the line segment PQ and the positive x-axis is 0.7 radians. Find the coordinates of Q, accurate to two decimal places.
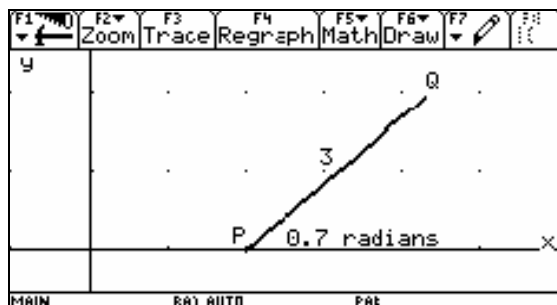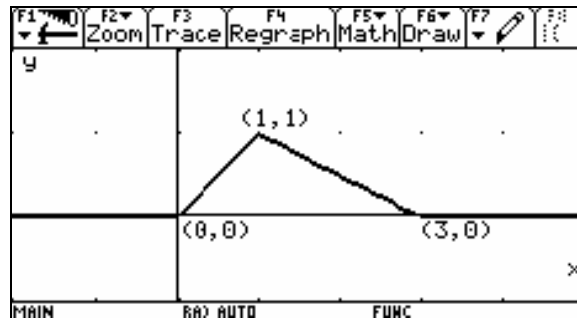

5. (30) f is a function; the new function g is defined by g(x) = f(x/2) – 1. (Note that the three parts of this problem describe three <u>different</u> functions f.)

    a. If f has the formula $f(x) = \dfrac{x+1}{x+2}$, find a formula for g(x).

(OVER)

b. If the graph of f is shown below, sketch a graph of g. (Be sure to give me enough information to locate the "corners" on your graph.)
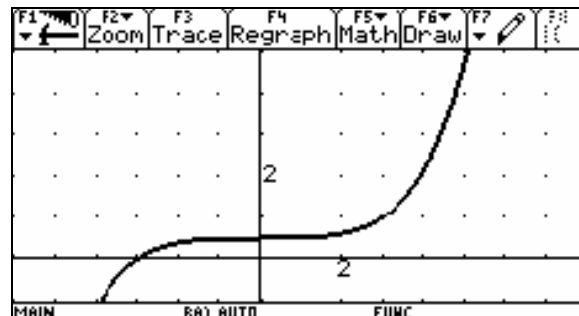

c. If five points on the graph of f are determined by the table below, give a similar table that identifies five points on the graph of g.

x	1	2	3	4	5
f(x)	2	3	5	8	12

6. (10) Find values for the constants a and b so that the graph of $y = a\,e^{bx}$ passes through the points (2, 2) and (3, 4).

7. (20) In each of the three cases below, f is an invertible (one-to-one) function. From the information given, extimate $f^{-1}(3)$. (Note that the three parts of this problem describe three _different_ functions f.)

a. f is only defined for x > 0, and is given by the formula $f(x) = 4 - \ln(2x^2)$.

b. The graph of f is as shown below.

c. Coordinates for five points on the graph of f are shown in this table.

x	0	1	2	3	4
f(x)	3.9	3.3	2.7	2.1	1.5